



Specifications for SWC #110: Pipe & Pipe Liner

1. Scope of Work

- 1.1 The purpose of this Statewide Contract is to provide multiple types and sizes of drainage pipes and slip liners. The drainage pipes and slip liners will be used for projects throughout the State and will be delivered to any Tennessee Department of Transportation (TDOT) storage site or Authorized User project site (see Attachment A: Location List). Additionally, this contract will include pump in place grout service. The grout will be installed in the annular space between the liner and existing pipe to be performed on various project sites throughout the State of Tennessee.
- 1.2 The absence of a detailed specification or description does not limit the quality of products rendered and shall be recognized as meaning that only the best commercial practices are to prevail and that only first-quality materials and workmanship are to be used and will be acceptable. Work shall comply with all industry standards and guidelines. Additionally, the TDOT 607G Specification, in effect as of the date of this Contract effective date, is included as Contract Attachment B.
- 1.3 Prior to utilizing SWC 110 to deliver a project, agencies should consult the by-laws, policy and procedure of the State Building Commission (SBC) to determine whether the project falls under SBC jurisdiction thus requiring additional approval(s). The by-laws, policy and procedure of the SBC can be found at:
https://www.tn.gov/content/dam/tn/statearchitect/documents/SBC_POLICY_MASTER.pdf.
- 1.4 The Contractor shall designate a contract manager for the contract. The contract manager will be a single point of contact for the state contract administrator and be responsible for addressing broad contract issues and requests brought to them by the state contract administrator. The contract manager should have the authority and competence to address and correct any issues related to the contract. The Contractor shall notify the state contract administrator in writing within three (3) business days of

assigning a new contract manager. Contact information shall be provided for each Contractor location awarded under SWC 110. Authorized Users must be able to reach out to each location with questions including, but not limited to the following: billing, invoices, and products.

2. Definitions

TDOT	Tennessee Department of Transportation
Central Procurement Office or CPO	Means the Central Procurement Office of the State of Tennessee acting by and through the Chief Procurement Officer or his or her designee as the context requires.
AASHTO	American Association of State Highway and Transportation Officials. Reference: www.transportation.org
ASTM	American Society of Testing and Materials. Reference: www.astm.org

3. Drainage Pipe Specifications

3.1 Corrugated Metal, Aluminized, and Culvert Pipe (Round)

- Contractor shall comply with all standard specifications as detailed in AASHTO M-274 as may be amended. See TDOT standard drawing D-PB-2 (Attachment C).

3.2 Corrugated Metal Aluminized Culvert Pipe (Arch)

- Contractor shall comply with all standard specifications as detailed in AASHTO M-274. See TDOT standard drawing D-PB-2 (Attachment C).

3.3 Concrete Drainage Pipe

- This pipe shall meet the requirements of subsection 914.02 of the 2015 TDOT Standard Specifications for Road and Bridge construction. See TDOT standard drawing D-PB-1 (Attachment D).
 - The 2015 TDOT Standard Specifications for Road and Bridge Construction can be found at the following URL:
 - <https://www.tn.gov/tdot/tdot-construction-division/transportation-construction-division-resources/transportation-construction-2015-standard-specifications.html>

3.4 Concrete, Box Culverts and Catch Basins

- These materials shall meet the requirements of subsection 914.08 of the 2015 TDOT Standard Specifications for Road and Bridge Construction.
 - The 2015 TDOT Standard Specifications for Road and Bridge Construction can be found at the following URL:
 - <https://www.tn.gov/tdot/tdot-construction-division/transportation-construction-division-resources/transportation-construction-2015-standard-specifications.html>

3.5 Corrugated Polyethylene (HDPE) Drainage Pipe (High-Density Polyethylene)

- The pipe liner shall consist of a HDPE profile wall pipe that conforms to the requirements of AASHTO M 294 for corrugated polyethylene pipe type "S" or "D", see TDOT standard drawing D-PB-2 (Attachment C).

3.6 Corrugated Polypropylene (PP) Drainage Pipe

- All polypropylene pipe and fittings shall meet the requirements contained in AASHTO M330 and or ASTM F3219/ASTM F 2764, type "S" or "D" wall.
- Extruded pipe and fittings shall be made of virgin polypropylene compounds as described in AASHTO M330 or ASTM F 3219/ASTM F 2764.
- Polypropylene compounds shall be comprised of the base polypropylene resin and all additives, colorants, UV inhibitors, and stabilizers.
- The pipe and fittings shall be free of foreign inclusions and visible defects such as cracks, holes, foreign inclusions or other injurious defects. See TDOT standard drawing D-PB-2 (Attachment C).

3.7 Profile Wall Poly Vinyl Chloride (PVC) Drainage Pipe

- Pipe shall consist of PVC corrugated pipe with a smooth interior that conforms to the requirements of AASHTO M304, poly vinyl chloride (PVC) profile wall drain pipe, and fittings based on controlled inside diameter of ASTM F 949.
- Use pipe made of PVC compound with a cell classification of 1245B per ASTM D 1784, see TDOT standard drawing D-PB-2 (Attachment C).

3.8 Steel Reinforced Polyethylene Drainage Pipe

- The pipe shall consist of a profile manufactured using a high quality stress-rated thermoplastic meeting the requirements of ASTM F 2562: "Standard Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage", or AASHTO designation mp-20: Bridge Construction section 26 & Design section 12.
- Virgin high density polyethylene stress-rated resins are used to manufacture the pipe and complimentary fabricated fittings.
- Resins shall conform to the minimum requirements of cell classification 345464C as defined and described in the latest version of ASTM D3350: "Standard Specification for Polyethylene Plastics Pipe and Fittings Materials". See TDOT standard drawing D-PB-2 (Attachment C).

4. Slip Liners

4.1 Profile Wall Poly Vinyl Chloride (PVC)

Pipe:

- Pipe liner shall consist of PVC corrugated pipe with a smooth interior that conforms to the requirements of AASHTO M304, poly vinyl chloride (PVC) profile wall drain pipe and fittings based on controlled inside diameter or ASTM F 949.
- Use pipe made of PVC compound with a cell classification of 1245B per ASTM D 1784.

Joints for Profile Wall Poly Vinyl Chloride (PVC):

- Join the PVC pipe liner with a PVC coupling that uses elastomeric sealing gaskets. The assembled joint shall meet the performance requirements of ASTM D 3212.
- The joint shall be able to be pulled or pushed into the host pipe without joint separation.
- Ensure that elastomeric seals meet the requirements of ASTM F 477.

4.2 Solid-Wall High Density Polyethylene Pipe (HDPE)

Pipe:

- High density polyethylene pipe and fittings shall meet the requirements in the AASHTO LRFD Bridge Design Specifications, Section 12, as a solid wall HDPE pipe meeting the requirements of specification AASHTO M 326.
- The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects.
- The pipe shall be as uniform as is commercially practical in color, opacity, density, and other physical properties.
- Pipe and pipe fittings shall be manufactured from high density compounds in accordance with ASTM D 3350, cell classification 345464C or (345474C) with a designation of PE 3408 or (PE 4710) and a minimum standard dimension ratio (SDR) of 32.5.
- Pipe shall be solid wall with a smooth interior and exterior with no corrugations or ferrous elements.
- Each pipe segment shall be marked on the outside with a coded number which identifies the manufacturer, SDR, size, materials, machine, date and shift on which the pipe was extruded.
- Pipe[s] shall be specifically applicable for installation and use in the project environment.

Joints for Solid-Wall High Density Polyethylene Pipe (HDPE):

- Joints shall be water-tight and soil tight meeting AASHTO M 326 over the range of head pressure expected for the pipe.

4.3 Smooth Wall Carbon Steel Plate Pipe Liner

Pipe:

- Pipe shall consist of arc welded straight seam pipe with .20 minim copper content for improved corrosion resistance for use in culvert rehabilitation and pipe linings.
- The pipe liners shall be round, elliptical, and arch shaped.
- Sections of a smooth wall carbon steel plate pipe must conform to the following requirements:
 - All pipe must be domestic and melted and manufactured in USA (MMU), made from new unused steel plates, and shall be straight seam pipe. Longitudinal seams welded after rolling must be welded by the automatic double submerged arc weld (DSAW) method. Joints or midwelds welded after rolling must be welded by automatic or semiautomatic DSAW, flux cored arc weld (FCAW) or gas metal arc weld (GMAW) methods, and splices and repair welds done before rolling must be welded by automatic, semiautomatic or manual DSAW, FCAW, or GMAW methods.

Each heat number of steel used for the pipe liner must be tested for chemical composition and tensile requirements that meet the following:

Carbon:	0.26 max
Manganese:	1.65 max, *See Note
Phosphorous:	0.035 max
Sulfur:	0.035 max
Copper:	0.20 max
Tensile Strength:	60,000 PSI min
Yield Strength:	36,000 PSI min

*For each 0.01 percent reduction of carbon below the maximum concentration shown above, a 0.05 percent increase of manganese is allowed up to a maximum concentration of 2 percent manganese.

- Pipe liner wall thicknesses should be no less than .500 (½") wall, or as determined by AASHTO HL-93 load bearing analysis. The minimum specified wall thickness to be used for round pipe liner made to this specification shall be .500 (½") nominal wall, and the wall thickness at any point shall not be more than 12.5% under the specified nominal wall thickness. The minimum specified wall thickness to be used for elliptical, arch, and other non-round pipe liner sections shall be .500 (½"), and the wall thickness at any point shall not be thinner than .015" under the specified wall thickness.

Joints for Smooth Wall Steel Plate Pipe:

- Welded steel pipe liner joints must be full penetration welds in accordance with American Welding Society AWS D1.1, allowing for Bevel X Plain End joint configuration.

4.4 Steel Reinforced Polyethylene Liner Pipe (SRPE)

Pipe

- The pipe profile shall be manufactured using a high quality stress-rated thermoplastic meeting the requirements of ASTM F2562: "Standard Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage" or AASHTO designation MP-20: Bridge Construction section 26 & Design section 12.

- Virgin high density polyethylene stress-rated resins shall be used to manufacture the pipe and complimentary fabricated fittings.
- Resins shall conform to the minimum requirements of cell classification 345464C as defined and described in the latest version of ASTM D3350 "Standard Specification for Polyethylene Plastics Pipe and Fittings Materials".

Joints for steel reinforced polyethylene liner pipe

- Low head (LH) joints (30" – 72") shall be gasketed, stress-rated high density polyethylene bell and spigot joints that have been laboratory tested to 3 psi when tested in accordance with ASTM D3212: "Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals".
- High performance (HP) joints (30" – 72") shall be gasketed, bell and spigot joints where both the bell and spigot are reinforced with steel that is fully encased in stress-rated high density polyethylene and that have been laboratory tested to 15 psi when tested in accordance with ASTM D3212 "Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals".
- Welded coupler (WC) joints (36" – 120") shall utilize plain ended pipe welded together with a polyethylene coupler by way of electro fusion welding or extrusion welding technology. The welded connections provide a true, infield watertight system. The field installed welded coupler joints shall remain watertight and can achieve zero leakage rates on appropriate applications. The welded coupler joints have been laboratory tested to 30 psi in accordance with ASTM D3212 standard specification for joints for drain and sewer plastic pipes using flexible elastomeric seals".

5. Pump In Place Grout

5.1 Grout Description:

- The grout shall consist of Portland cement, meeting the requirements of ASTM-C150, a foaming agent, meeting the requirements of ASTM-C869 and water and have a density of between 40 and 50 lbs/cf.
- Grout will be installed into the annular space between the existing pipe and the pipe liner (installed by TDOT).
- TDOT will provide traffic control, constructing bulkheads, vent tubes, grout tubs, and blocking if needed.
- The Contractor shall comply with all specifications as detailed in the "Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction, January 1, 2015 – section 921.09, available online at: <https://www.tn.gov/tdot/tdot-construction-division/transportation-construction-division-resources/transportation-construction-2015-standard-specifications.html>

5.2 Grout Equipment:

- Grout shall be pumped by the Contractor with a concrete pump that can be regulated to provide a delivery pressure of no greater than 2 psi and have a Viper turbo air foam generator or equal.

5.3 Grout Contractor Responsibilities:

- Contractor shall provide at least two trained and experienced technicians per job.
- Contractor shall ensure that all voids are filled by pumping grout from downstream of culvert and continue pumping until grout is expelled from the highest vent tube on the inlet end.
- Contractor shall take appropriate precautions to avoid over pressurization, buckling and floating of the slip liner pipe during the grouting process. Pressure on the annular void shall not exceed 2 psi to avoid damage to the liner pipe. Regardless of the pressure, the Contractor shall be solely responsible for any damage or distortion of the liner pipe due to the grouting process.
- The Contractor shall comply with the pipe manufacturer's recommendations for grouting procedures. Multiple grout lifts may be required to avoid buckling the liner pipe.
- The Contractor shall take all necessary precautions to protect and preserve the interior of the pipe from damage. Spills shall be minimized and cleaned up immediately. Any damage to the pipe caused by the Contractor occurring during the grouting operation shall be repaired by a method approved by the Authorized User at no additional cost to the State.